Biologically Damaging UV in the Shade

D.J. Turnbull, A.V. Parisi

Faculty of Sciences, University of Southern Queensland, Toowoomba, 4350.

INTRODUCTION: A common misconception is that shade protects the human body against ultraviolet radiation. While direct UV from the Sun is generally reflected or absorbed by the shade structure, the diffuse component is still present in the shade. Atmospheric scattering is the main cause of the diffuse UV, although other factors impact on the amount of UV radiation that exists in the shade. Over exposure to this diffuse radiation may cause a number of conditions mainly erythema and photokeratitis. This paper describes the research conducted using a scanning UV spectroradiometer, for different shade environments, and the possible resulting damaging effects on the skin and eyes.

METHODS: The protective nature of specific shade environments was investigated by measuring the spectral UV in 1 nm increments with a calibrated spectroradiometer in the shade for the three planes of horizontal, 45^{o} and vertical and comparing this to that on a horizontal plane in full sun. The spectral UV irradiance measurements were made under clear sky conditions at a sub-tropical Southern Hemisphere site. The solar UV in the shade of a shade umbrella, covered veranda, covered sand pit and covered walkway were measured for an increasing solar zenith angle, between March and August of 2001, for the times of 11:30 am - 12:30 pm and 2:30 pm - 3:30 pm.

RESULTS: The Ultraviolet Protection Factor's (UPF's) of the shade structures ranged from 1.4 to 10 with a general decrease from noon to afternoon. For a shade umbrella placed on dry grass with no surrounding vegetation, UV levels in the shade reached approximately 81% and 84% of that in the full sun for erythema and photokeratitis respectively. For a covered sand pit with trees and shrubs in close proximity, damaging UV levels were less than half that of the shade umbrella. Observations also showed that the diffuse UV levels in the shade increased as the solar zenith angle increased, amplifying the damaging effects.

CONCLUSION: This research shows that there is sufficient UV in the shade to cause sunburn and increase the risk of sun-related eye disorders in a short period of time. Shade structures must be given careful consideration when construction occurs. Even though the UV transmission through the materials may be very low, it is the construction of the entire shade setting that determines the exposure beneath the shade structure.